Multi-Sensor Data Fusion for Bottom Mapping and Ordnance Location

John Wright, Ken Scott, Tien-Hsin Chao, and Brian Lau
Jet Propulsion Laboratory

John Lathrop and John McCormick
NAVSURFWARCEN COASTSYSTA
DAHLGREN DIV

Results of ongoing work in developing methods for performing multi-sensor fusion for the purpose of locating unexploded ordnance in shallow water and creating models of the seafloor for visualization are presented. The sensor suite includes a forward-looking sonar, a low-frequency side-looking sonar, a high-frequency side-looking sonar, a magnetic field gradiometer, and an electro-optic laser-scanning sensor. Data fusion techniques discussed include an iterative method of performing automatic target recognition (ATR) on individual sensor channels, correlating the individual sensor channels for a single pass using the target locations to assist the process, performing correlations on multiple passes over the same target area, and returning the correlated data to the ATR algorithms. The second pass of the ATR algorithms on the correlated data provides an additional method for locating and identifying targets while rejecting clutter. The focus is on the multi-sensor correlation and fusion techniques rather than the ATR algorithms. Correlated sensor data, along with GPS information, is used to create three-dimensional models of the sea floor. The sea--floor models are used for visualization of the area around an item of unexploded ordnance to assist in planning remediation of the site. Fusion of multi-sensor data, and the production of models of the sea floor, are important. capabilities for autonomous underwater vehicles. The models can be used for autonomous vehicle navigation and operation while the data may be transmitted to a base station for additional analysis purposes.

Primary Point of Contact:
John Wright
Jet Propulsion Laboratory
4800 Oak Grove Dr. 168-414
Pasadena, CA 91109
818-393-2706
john.r.wright@jpl.nasa.gov

Other Authors:
Ken Scott
Jet Propulsion Laboratory
4800 Oak Grove Dr. 168-414
Pasadena, CA 91109
818-354-8482
kenneth.c.scott@jpl.nasa.gov

Tien-Hsin Chao
Jet Propulsion Laboratory
4800 Oak Grove Dr. 300-329
Pasadena, CA 91109
818-354-8614
tien-hsin.chao@jpl.nasa.gov

Brian Lau
Jet Propulsion Laboratory
4800 Oak Grove Dr. 300-329
Pasadena, CA 91109
818-393-5056
brian.k.lau@jpl.nasa.gov

John Lathrop
NAVSURFWARCEN COASTSYSTA
DAHLGREN DIV

6703 W. Hwy 98, Bldg 376
Panama City, FL 32407-7001
904-234-
lathrop_john@ccmail.ncsc.navy.mil

John McCormick
NAVSURFWARCEN COASTSYSTA
DAHLGREN DIV
6703 W. Hwy 98, Bldg 3"/6
Panama City, FL 32407-7001
904-234-
mccormick_john@ccmail.ncsc.navy.mil